

## CLAIMS

What is claimed is:

1. A method for processing upstream packets of an optical network, comprising the steps of:
  - 5 for a group of subscriber optical interfaces in the optical network,
    - receiving status messages from the subscriber optical interfaces;
    - calculating reservation information for upstream
    - 10 transmission from the status messages;
    - calculating a duration of upstream transmission time slots for each subscriber optical interface; and
    - transmitting the calculated the duration of the upstream transmission time slot to each subscriber optical interface; and
    - 15 receiving upstream transmissions from each subscriber optical interface during respective calculated upstream transmission time slots.
  2. The method of claim 1, wherein each status message indicates how much data that may be forwarded by a subscriber optical interface.
  - 20 3. The method of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the steps of:
    - determining whether a subscriber optical interface is active; and
    - evaluating a queue size of a subscriber optical interface.
  - 25 4. The method of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the step of filtering an offered load for a subscriber optical interface in the time domain.

5. The method of claim of claim 1, wherein the step of calculating a duration of upstream transmission time slots further comprises the step of adding to a token bucket a number of tokens that are approximately equal to a sustained rate of a subscriber optical interface.

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6. The method of claim 1, further comprising the step of determining whether to hold upstream packets at a subscriber optical interface prior to transmission if an upstream transmission timeslot is not large enough to accommodate the upstream packets.

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7. The method of claim 1, further comprising the step of determining whether to receive upstream packets from a particular subscriber optical interface based upon whether how much data other subscriber optical interfaces in a same subscriber group are planning to send.

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8. The method of claim 1, further comprising the step of determining whether to receive upstream packets from a particular subscriber based upon whether a service level granted to a subscriber optical interface.

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9. A computer-readable medium having computer-executable instructions for performing the steps recited in claim 1.

10. An optical network system comprising:  
a plurality of subscriber optical interfaces; and  
an optical tap routing device coupled to the plurality of  
subscriber optical interfaces, said optical tap routing device further comprising a  
5 memory device and central processing unit coupled to said memory device, wherein  
said central processing unit is programmed to perform the steps of:  
calculating a length of a time interval for upstream  
transmission by a subscriber with a token bucket algorithm; and  
obtaining at least one packet from each subscriber of the  
10 plurality of subscriber optical interfaces during the time interval such that collision of  
packets originating from different subscribers of the plurality of subscribers is  
substantially reduced.

11. The optical network system of claim 10, wherein the central  
15 processing unit is further programmed to perform the steps of:  
monitoring a bandwidth of a first subscriber optical  
interface; and  
offering a portion of the bandwidth not used by the first  
subscriber optical interface to one or more other second subscriber optical interfaces.

12. The optical network system of claim 10, wherein the central  
processing unit is further programmed to perform the step of determining whether to  
receive upstream packets from a particular subscriber based upon whether a service  
level granted to a subscriber optical interface.

13. A method for processing upstream packets of an optical network, comprising the steps of:

for a group of subscribers in the optical network,

receiving a request from a subscriber to transmit

5 one or more upstream packets;

determining whether the one or more upstream

packets can be processed;

sending a message to the subscriber indicating

whether the one or more upstream packets can be processed; and

10 receiving the upstream packets if it is  
determined that the one or more upstream packets can be processed.

14. The method of claim 13, wherein the step of determining  
whether upstream packets can be processed further comprises the step of calculating  
15 available upstream bandwidth with a token bucket algorithm.

15. The method of claim 13, wherein the step of determining whether  
upstream packets can be processed further comprises the step of calculating available  
upstream bandwidth based upon what other upstream packets other subscribers are  
20 planning to transmit.

16. The method of claim 13, wherein the step of determining  
whether upstream packets can be processed further comprises the step of determining  
an upstream bandwidth subscription service level of a subscriber.

17. The method of claim 13, wherein the step of determining  
whether upstream packets can be processed further comprises the step of calculating  
available upstream bandwidth based upon a total upstream data traffic load that is  
destined for the data service hub.

18. The method of claim 13, wherein the step of sending a message further comprises the step of sending a message indicating an amount of packets that can be transmitted upstream by a subscriber.

5 19. The method of claim 13, further comprising the step of discarding holding the upstream packets at the subscriber if it is determined that the one or more upstream packets cannot be processed.

20. The method of claim 13, further comprising the step of  
10 allocating bandwidth between subscriber optical interfaces according to a weighted max-min mathematical algorithm.

21. A computer-readable medium having computer-executable instructions for performing the steps recited in claim 13.

15 22. The method of claim 1, wherein the step of calculating the duration of the upstream transmission time slots further comprises calculating the duration with a token bucket emulation algorithm.